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Improvement to dosing valves functioning with the action of a compressed gas

There are several types of dosing valves functioning under the action of a compressed gas. These valves use a deformable membrane through which the pressure provided by the propulsion gas is transmitted to the product to be ejected.

The membrane should be elastic, so that, on one hand, it can recover its initial shape after compression and discharge of the product and on the other, so that the pocket can suck a new dose.

The current means used to achieve these results are:

1- Use of rubber to obtain a dosing chamber, a material having an inherent elasticity sufficient to suck the dose. Unfortunately, many products cause the swelling or the dissolution of the natural or synthetic rubbers, a fact that limits to a great extent the possibilities of the valve.

2- Achievement of a dosing chamber from non elastic plastic substances, such as polyethylene having an accordion like shape allowing it to have the required elasticity. This dosing chamber is very difficult to make and if the product is slightly viscous, the chamber does not have enough elasticity to recover its initial shape after sucking the dose. Furthermore, gas bubbles stay stuck immobilized in the folds of the accordion and mess up the dose by discharging an excess quantity of product whose volume is represented by the difference of the volumes of the bubbles when under pressure and when relaxed.

In these two cases, the required pressure to flatten the chamber and expulse the dose rises with the flattening, and it could happen that the available pressure becomes insufficient to expulse the entire dose thus causing the poor distribution of the product.

In order to overcome these disadvantages and according to the invention, we propose a dosing chamber with rigid walls made of a cylinder inside of which travels a free piston subjected to the action of a return spring.

To avoid the an increase of resistance as the dose is emptied, the volume of the chamber is much larger than that of the discharged dose and the piston stops in its travel before the resistance becomes to important, this enables one to obtain correct doses of mist all the way to the end.

According to a mode of practice of the invention, the dosing valve comprises a vessel, formed by two superposed communicating chambers, in which are arranged to mobile and independent elements, a valve and a piston, each subjected to the action of return spring. The controlled displacements of the valve insure either the communication of the vessel with the product or, after interruption of this communication, the communication of the vessel with the exterior. The piston being under the pressure of the product is then displaced inside the vessel causing thus expulsion under pressure of a desired quantity of product. The piston returns to its initial position when an action of the valve reestablishes the communication between the vessel and the product.

The whole construction of the valve being compact there is little possibility for air bubbles to stick to the walls, a fact that increases the pressure of the dose.

The following description, with reference to the accompanying drawing, which is given as a non limiting example only, will help in the understanding of how the invention can be used. The resulting particularities from the drawing as well as the explanation are obviously part of the invention.

Figure 1 shows an axial section of a dosing valve conforming to the invention in a rest position.

Figure 2 shows the valve in a dose distribution position.

The dosing valve comprises a body inside of which are located all the pieces that make up the valve, said pieces being held in the body 1 by a cap 2 inserted at the mouth 1a of the body 1. The body is assembled in the well known manner to a plunger 3.

A sheath 4 extends on nearly the whole height of the body 1 is engaged by soft friction, at the location of the seat 4a, in the bore of the said body 1, the external diameter of the sheath is smaller that that of the bore of the body in order to leave an annular space 5 between the sheath and the bore of the body. This annular space is communicating, on one hand with the interior of the sheath 4 by lateral holes 6, and on the other by notches 6a, established along the bottom end 4b of the sheath 4, with the interior of the plunger 3, that is to say with the interior of the receptacle containing the dosing valve.

The inside of the sheath 4 makes a vessel comprising two superposed cylindrical chambers 7 and 8 communicating between themselves by the central hole 9.

Located in chamber 7 is a valve 10 applied against a sealing gasket 11 by the action of a spring 12. This valve is provided by two rings 13 and 14. an axial bore 15 of the valve establishes communication with the exterior via a conduit 16.

The valve 10, is extended by a stem 10a comprising an axial bore 17 in which comes a conduit 18 whose external orifice is located below a sealing gasket 19 held by the cap 2 on a stop 1b resting on the gasket 11.

In chamber 8 travels a piston 20 with rings 21. This piston is subject to the action of a spring 22 acting to maintain the piston in the end of run position against the seat 1b of the body 1.

The operation of the dosing valve assembled in this manner takes place as follows:

In resting position, (figure 1), the compressed gas trapped in the vessel on which is mounted the valve, pushes the product, contained in the said vessel, by the plunger tube 3, the annular space 5 and the conduits 6, in the inside of the sheath 4 and fills the free volume.

When one acts in the direction F (Figure 2) on the head of the spraying head, represented schematically in 23, one causes the travel towards the bottom of the valve 10. In a first portion of the travel, the gasket (ring) 14 is brought below the canals 6 an action that cuts the communication between the inside of the vessel and the inside of the sheath.

In the second portion of the travel of the valve, the conduit 18 is brought above the ring (gasket) 11 (figure 2), an action that puts the interior of the sheath 4 in communication with the bore 17 and the spraying orifice meaning with the atmosphere.

Under the pressure of the product contained in the vessel, the piston 20 is pushed towards the top thus compressing the spring 22. During its travel, limited by a stop 24, the piston discharges a given quantity of product through the bore 15, the conduits 17 and the bore 17 following the path indicated by the arrows f in figure 2.

When the product is no longer discharged under pressure, one stops the action on the spraying head 23. Under the action of the spring 12, the valve10 is brought against the gasket 11, the conduit 18 being thus placed between the two gaskets 19 and 11 whereas the gasket 14 is back above the conduits 6 putting this way the interior of the sheath 4 in communication with the interior of the vessel.

Under the action of the spring 22, the piston 20 returns to its original position and the sucking effect, resulting from the travel of the piston, completes the action of the pressure on the product to completely fill the interior of the sheath 4.

A new quantity of similar volume to the discharged quantity previously can then be distributed by the action of the valve 10.

This quantity constitutes, the dose of the product discharged at each operation of the valve 10. This dose is defined by the difference between the free volume inside the sheath 4 when the valve 10 and the piston 20 are in resting positions (figure 1) and the free volume when the valve and the piston are in the positions indicated by figure 2.

One can, in a valve designed for a given dose, modify the amount of the said dose by modifying the length of travel of the piston 20.

In fact, the longer the travel of the piston 20, the larger is the difference between the two volumes and inversely, the shorter the travel of the piston, the smaller is the difference between the two volumes.

By using a series of pieces, one would be able to increase the travel of the piston 20 by reducing its height h, and to reduce its travel by intercalating a ring 25 between the top end of the piston and the stop 24 or (even though this less recommended method may modify the elastic characteristics of the spring 22) by intercalating a ring 25a between the bottom 20a of the piston and the bottom 1b of the body 1, this ring comprising on its edge in contact with the bottom 1b, notches analogous to the notches 6a of the sheath 4.

It is well understood that modifications can be applied to the modes of practice of the invention, in particular by substitution of equivalent technical solutions without deviating from the scope of the invention.

Summary

The present invention comprises:

1- A dosing valve for a vessel containing a product under pressure, said valve comprises a container, made of two superposed communicating chambers, in which are located two mobile and independents elements, a valve and a piston, each being under the action of a return spring. The controlled displacements of the said valve insure either the communication of the container with the product, or after interruption of this communication, the communication of the container with the exterior. The piston being under pressure from the product is displaced inside the container provoking the discharge, under pressure of a given quantity of product that makes up the desired dose. The piston then returns to its resting position by action of the valve and the communication between the container and the product is re-established.

2- Modes of application of the dosing valve specified in 1 presenting the following particularities taken separately or according to possible combinations:

a- The container is made of the interior of a sheath engaged in the valve body bore with which it is in contact through a seat. The diameter of the sheath being outside of this seat and smaller than the bore in order to provide a annular opening that communicates with the product to be distributed.

b- The chamber containing the piston is open at its base such that the piston is subject to the pressure of the product to be distributed.

c- A cap set on the top part of the body of the valve keeps the assembly of the valve inside the body.

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Fig. 1

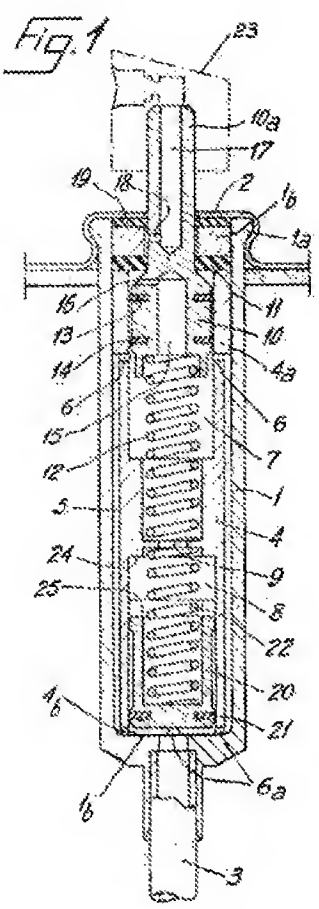
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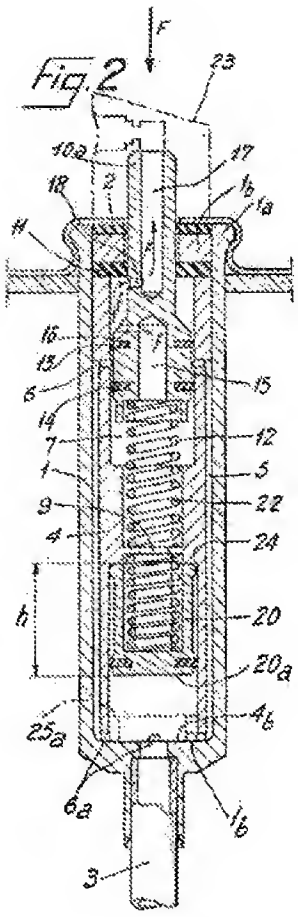
Fig. 2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